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CALIFORNIA ENERGY COMMISSION

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This report does not represent the official position of the California Energy Commission until adopted at the November 12, 2003 Business Meeting.

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Executive Summary

As the fifth largest economy in the world, California is a nation state that runs on energy. Every day, we spend \$82 million for gasoline and diesel, \$82 million for electricity, and \$22 million for natural gas. And although Californians use energy very efficiently, energy supplies have not necessarily been affordable, nor have they been reliable.

The state's flawed electricity restructuring experience caused prices to skyrocket, with Californians systematically removed from the grid on several occasions to avoid widespread blackouts. But state government responded to the crisis by investing nearly \$1 billion for new efficiency programs, and consumers quickly flexed their power by replacing inefficient appliances, turning down their thermostats, and postponing energy-intensive appliance use during the hottest afternoons. The end result—California consumers reduced peak demand in 2001 by more than 10 percent, or approximately 6,000 megawatts.

Streamlined permitting procedures encouraged new power plant construction, and more than 9,500 megawatts of generation capacity were added in just 3 years—the largest expansion of the power plant fleet in California history.

In addition to skyrocketing electricity costs, natural gas prices at the height of the energy crisis rose to nearly \$60 per million British thermal unit, or Btu, more than 10 times the average price. Working together, utilities and regulators increased the state's natural gas pipeline capacity by 25 percent and its total storage capacity by nearly 10 percent. These improvements allowed more natural gas to flow where needed, helping to moderate prices.

In contrast to price increases in the electricity and natural gas markets, price increases in the gasoline and diesel fuel markets are felt immediately at the pump. Typically, retail fuel prices rise rapidly, but drop slowly. Twice this year, fuel prices have reached record levels, and in past years, there have been frequent price spikes. With few viable alternatives, consumers wait for prices to settle.

Despite the current calm in the state's energy system, California's demand for energy is growing, fueled by an expanding population and growing business sector. State government must act now to promote public policies that secure additional energy supplies and infrastructure improvements to protect California from future supply disruptions and high prices.

Electricity. Although electricity markets appear relatively stable for now, Californians still pay, on average, the fifth highest rates in the nation. Under average conditions, the state's electricity generation system has adequate supplies to meet demand for at least the next six years. Hot weather, coupled with other factors, however, could reduce reserves to very low levels as early as 2006. The Energy Commission believes that

assuring adequate electricity resources should be a cornerstone of energy policies in California.

If the state is to meet growing demand with adequate and preferred resources, California must use an integrated process that accounts for electricity demand and supply variations, efficiency gains, dependence on natural gas, and local reliability problems as in San Francisco and San Diego. The process must also account for expansions and upgrades of the bulk transmission system; strategies for retiring or modernizing older, less-efficient natural gas-fired power plants; and the benefits to the electric system of allowing consumers to choose their own electricity supplier and develop their own supply through distributed generation and cogeneration.

Further, the state is taking steps to reduce the electricity demand by implementing new efficiency standards and programs and dynamic pricing, and aggressively developing renewable energy resources, as required under California's Renewables Portfolio Standard.

Natural Gas. Even though prices are currently stable, Californians now pay \$5 per million Btu, roughly double the price consumers paid in the 1990s. California competes with other states for natural gas and depends on out-of-state resources for 85 percent of its supply. With the state located at the end of the inter-state natural gas pipelines, California is vulnerable to further natural gas supply disruptions and price volatility. This leaves businesses and consumers exposed to higher and more volatile electricity prices.

To help moderate demand, the state needs to increase its energy efficiency programs and diversify its fuel mix by accelerating the Renewables Portfolio Standard.

Above all, California must actively promote infrastructure enhancements such as additional pipeline capacity, incentives for increased operation and use of in-state storage, in-state productive capacity, and nontraditional supply sources such as liquefied natural gas.

Transportation Energy. Even more pressing than the difficulties in the electricity and natural gas markets, tight supplies and volatility characterize California's gasoline and diesel market. In-state refineries operate near maximum capacity. Compounding the problem, California refiners must now add ethanol to gasoline to replace MTBE, which will further reduce in-state production.

In addition, California's import and storage systems have little, if any, excess capacity, and as demand for gasoline continues to grow, so will California's reliance on imports of refined petroleum products, further exacerbating California's tight gasoline and petroleum market.

Any refinery outage or pipeline failure, as happened this past August in Arizona, can quickly translate into high prices for gasoline and diesel fuel at the pump. This event left California consumers paying an average of \$2.10 for a gallon of gasoline.

In the short-term, the state must act to expand its petroleum infrastructure facilities, removing the barriers for industry to obtain needed permits in a timely manner, without jeopardizing environmental quality. But in the long-term, unless the state acts aggressively to change these emerging energy trends, California could face further supply disruptions and price volatility.

In July 2003, the Energy Commission and California Air Resources Board approved a joint strategy to reduce California's near total reliance on petroleum for transportation. This strategy depends primarily on raising new vehicle fuel economy standards and, to a lesser extent, increasing the use of alternative fuels and advanced vehicle technology. The petroleum industry has cautioned that a strategy to significantly reduce long-term demand for petroleum, will create disincentives for the private investments needed now to expand and upgrade critical import and storage facilities.

Recommended Actions for the Governor and Legislature

The Energy Commission believes that state energy policies should capture the best features of both prudent and effective regulation and vigorous, competitive energy markets that provide adequate investment opportunities. These policies should promote affordable energy supplies; improve energy reliability; and enhance public health, economic well-being, and environmental quality.

The Energy Commission also believes that targeted research and development is a necessary means of advancing new, more efficient, and cleaner technologies into the market.

The following energy policy recommendations, highlighted from the body of this report, reflect these principles.

Electricity

California must enhance its electricity infrastructure to ensure long-term electricity supply, reliability, and security; minimize risk; and manage costs:

- Ramp up public funding for cost-effective energy efficiency programs above current levels to achieve at least an additional 1,700 megawatts of electricity by 2008.
- Deploy advanced metering systems and rate structures to help link retail prices with wholesale costs.

- Enact legislation to require that all load-serving entities meet the RPS goal of 20 percent of retail electricity sales and to accelerate the target date for reaching the goal from 2017 to 2010, with a more ambitious target for 2020.
- Explore through a collaboration between the CPUC and the Energy Commission how to move to a core/noncore market structure for electricity, with the goal of making recommendations in 2004.
- Create a transparent electricity distribution system planning process that addresses the benefits of distributed generation, including cogeneration.
- Incorporate the forecasts, resource assessments and policy preferences of the Energy Report into an explicit resource adequacy requirement for all retail electricity suppliers to guide resource procurement.
- Consolidate the permitting process for all new bulk electricity transmission lines within the Energy Commission, using the siting process at the Energy Commission as a model.

Natural Gas

California must reduce demand for natural gas, diversify supplies, and increase the use of storage facilities:

- Increase funding for natural gas efficiency programs that could achieve an additional 100 million therms of natural gas.
- Promote the construction of liquefied natural gas facilities and infrastructure and coordinate permit reviews with all entities to facilitate their development on the West Coast.
- Ensure that existing natural gas storage capacity is appropriately used to provide adequate supplies and to protect prices.
- Remove barriers to the use of natural gas produced in California to ensure that California production can be delivered to consumers.

Transportation Energy

California must improve its petroleum infrastructure and reduce its demand to reduce the risks of supply disruptions and price volatility of transportation fuels.

- Adopt a goal of reducing demand for on-road gasoline and diesel to 15 percent below 2003 levels by 2020 based on identified strategies that are achievable and cost-beneficial.

- Build a coalition with other states and stakeholders to influence Congress and the U.S. Department of Transportation to double the combined fuel economy of new passenger cars and light trucks by 2020. If the federal government fails to revise corporate average fuel economy standards, California must reassess its petroleum reduction strategy.
- Increase the use of nonpetroleum fuels to 20 percent of on-road fuel consumption by 2020 and 30 percent by 2030 based on identified strategies that are achievable and cost-beneficial.
- Establish a one-stop licensing process for petroleum infrastructure, including refineries, import and storage facilities, and pipelines that would expedite permits to increase supplies of transportation energy products available to California while maintaining environmental quality.

Environment

The state should partner with its neighbors to establish leadership positions to address global warming by undertaking actions including, but not limited to, the following:

- Require reporting of greenhouse gas emission as a condition of state licensing of new electric generating facilities.
- Account for the cost of greenhouse gas emission reductions in utility resource procurement decision.
- Use sustainable energy and environmental designs in all state buildings.
- Require all state agencies to incorporate climate change mitigation and adaptation strategies in planning and policy documents.

Some Guiding Thoughts

This Energy Report establishes a real-time, dynamic process for continuing dialogue on California's energy issues. The recommendations in this report represent an aggressive, wide ranging agenda for decision makers, businesses, and individuals. Finally, the Energy Commission believes that this report, along with its subsidiary volumes, lays the proper foundation for future action.

Section I: Introduction

In the fall of 2002, the Legislature passed Senate Bill 1389 [Chapter 568, Statutes of 2002, Bowen] requiring the Energy Commission to prepare a biennial integrated energy policy report, or Energy Report. This first Energy Report is due to the Governor in November, 2003.

In passing SB 1389, the Legislature made clear that the Energy Report would be the foundation of energy policies and decisions affecting the state. The statute directs state entities to carry out their energy-related duties and responsibilities based upon the information and analyses contained in the Energy Report.

The Energy Report consists of a Policy Report and three Subsidiary Volumes. In the Policy Report, the Energy Commission assesses the major energy trends and issues facing the state and uses these results to recommend energy policies that balance broad public interests to conserve resources, protect the environment, ensure energy reliability, enhance the state's economy, and protect public health and safety.

The three Subsidiary Volumes address:

- Electricity and Natural Gas
- Transportation Fuels, Technologies, and Infrastructure
- Public Interest Energy Strategies

Report Development and Outreach

To develop these volumes, the Energy Commission staff undertook numerous technical studies examining all aspects of energy supply, production, transportation, delivery and distribution, demand, and pricing.

Throughout the spring and summer of 2003, the Energy Commission staff held many workshops on the three Subsidiary Volumes and supporting technical studies. At these workshops, technical experts critiqued the staff's work and provided valuable comments. The Energy Commission staff consulted with key federal, state, and local agencies in preparing these studies, and involved more than 140 public and private stakeholders. The more than 3,000 pages comprising the Subsidiary Volumes and supporting technical studies lay the foundation for the Policy Report.

Since the Policy Report contains recommendations that will affect all Californians, the Integrated Energy Policy Report Committee conducted a series of hearings throughout California in early October 2003. The Committee received substantial and thoughtful comments from key public interest groups, energy developers, the business community, and general public. The committee has studied these comments and used them to further shape the final Policy Report.

Strategies to Guide California's Energy Future

The Policy Report identifies four overarching strategies that serve as the basis of California's energy systems. It is imperative, therefore, that the State of California take all necessary steps to implement the recommendations contained in this report. In doing so, the Governor, Legislature, and other state agencies, in addressing energy-related issues, should give great weight to strategies that:

- continue to harvest energy efficiency programs
- diversify fuels and fuel sources of petroleum and natural gas with alternative fuels and renewable energy
- offer consumers energy choices
- strengthen the state's energy infrastructure

These strategies will provide the stable environment necessary to attract investments to meet the demand for more energy resources and services and protect our economy and environment.

Updates to the Energy Report in 2004 and Beyond

In passing SB 1389, the Legislature intended this process to be a dynamic policy tool, requiring the Energy Commission to submit updates to the Energy Report every other year, beginning in November 2004. Work has already begun for a 2004 update in the following critical areas:

- re-powering, refurbishing, replacing old power plants
- transmission planning and permitting
- long-term renewable targets

Report Organization

Following this brief introduction, the Energy Report is organized into the following sections:

Section II	Electricity
Section III	Natural Gas
Section IV	Transportation Energy
Section V	Stewardship of the Environment
Section VI	Future Work and Concluding Observations

Section II: Electricity

California's electricity system appears stabilized for now, but faces critical challenges for the years ahead.

There have been major investments to increase generating capacity in California and the surrounding Western states. These additions have helped to alleviate immediate concerns about adequate supply and price volatility. However, average retail prices for electricity in California are still among the highest in the nation. To address future supply and price concerns, California needs a balanced mix of supply and demand-side options that help to capture energy efficiency opportunities, allow for customer choice, diversify our electricity system, and strengthen our electricity infrastructure.

To maintain reliable supplies and reduce prices, California must establish resource adequacy requirements for all suppliers of retail electricity. The Energy Commission uses the term resource adequacy to encompass an integrated planning, procurement, and monitoring process for electricity suppliers in California. This process should assess the supply and demand for electricity, as well as the most prominent risks to the reliability of the system and electricity consumers in terms of electricity costs, and establish benchmarks to assure that adequate planning reserves are maintained.

One of California's highest priorities is to ensure that electricity is used as efficiently as possible. Lowering per capita electricity consumption through standards and energy efficiency programs will benefit Californians substantially. In addition, reducing peak demand for electricity also can help to address consumer costs and environmental concerns, as well as avoid the need for investments in generation equipment that operates only a few hours a year.

California is increasingly dependent on natural gas for its electricity. Natural gas costs are a large component of wholesale electricity costs. Volatility in the natural gas markets can drive up wholesale electricity prices, especially during peak demand periods when gas-fired resources are the marginal supplies that establish the wholesale market clearing price. The state can reduce the demand for natural gas to generate electricity by aggressively developing energy resources required under California's Renewables Portfolio Standard (RPS).

California consumers and businesses would benefit from having choices available to meet their unique electricity needs more effectively. This includes being able to choose an alternative energy provider through a well designed core/noncore retail market structure. In addition, consumers and businesses should be able to supply their own generation through the deployment of distributed generation and cogeneration. This will necessitate continued effort to remove barriers to their implementation and the establishment of effective electricity distribution system planning.

The state can further reduce natural gas consumption for electric generation by taking steps to retire older, less efficient natural gas-fired power plants and replace or repower these facilities with new, more efficient plants. The state must take care in targeting such retirements as many older plants operate to provide critical grid reliability.

The state's bulk transmission system needs major upgrades and improvements. The broken transmission permitting process in the state must be fixed so that needed transmission investments can move forward.

Recent Trends in Meeting California's Electricity Needs

California's electricity system is a complex grid of electric power plants and transmission lines which meets the state's need for electricity by instantaneously balancing supply and demand. The California grid interconnects to the surrounding Western States, Mexico, and Canada, allowing utilities to exchange energy and share reserve support to the benefit of the broader region. This also means that problems in one area of the grid can have price and reliability impacts throughout the region. Assuring adequate generation and transmission are critical to assuring reliability and grid stability at reasonable prices.

As California's economy expanded in the 1990s, so did its electricity consumption. Although California's energy efficiency standards slowed the growth of per capita electricity use, power plant development in California and the West did not keep pace with demand growth. This lack of investment in electricity infrastructure was largely a result of uncertainties surrounding the pending electricity market restructuring at the state and federal levels.

In the summer of 2000, wholesale electricity prices began to increase dramatically. As the winter of 2000-2001 approached, the price of natural gas more than doubled, further exacerbating already high electricity prices. Prices continued to climb during the winter and electric utilities throughout the West incurred enormous costs to purchase electricity.

The reliability of the California grid was in jeopardy numerous times throughout the summer of 2000 and, more surprisingly, during the winter of 2000-2001 when demand is typically low. Utilities were forced to institute systematic rotating outages on several occasions to maintain grid stability and prevent more severe and widespread blackouts.

Supply shortages and high prices during this energy crisis were exacerbated by transmission congestion problems. The transmission systems of the state's utilities were originally designed and operated to meet their own customer needs. Major investments in higher-voltage bulk transmission made during the 1960s through the early 1990s allowed utilities to import cheap power from the Pacific Northwest and Southwest regions. These upgrades also facilitated electricity transfers between utilities within the state.

In recent years, however, investor-owned utilities (IOUs) have not been successful in obtaining the necessary construction approvals for major bulk transmission upgrades to move power within the state and to access imports from the remainder of the Western region.¹ As a result, congestion on the transmission system has become a more frequent occurrence since the mid-1990s. During the energy crisis, transmission congestion frequently hampered the effective transfer of electricity to meet demand at critical times and contributed to the run-up in wholesale prices.

Amid these serious problems, two factors emerged that played a key role in helping California through the summer of 2000. Despite not being paid for generation as a result of the adverse financial condition of the IOUs, cogeneration and renewable facility operators maintained relatively high levels of availability and were largely responsible for keeping the lights on during the darkest days of the crisis.

Also, in response to rising retail prices and statewide public information campaigns, Californians voluntarily reduced electricity consumption to unprecedented levels, shaving approximately 6,000 MW² off peak demand statewide. Surprisingly, recent analyses show that as much as half of these conservation efforts are producing permanent savings.³

California's electricity system appears to have sufficient planning reserves to balance supply and demand for the next few years. Since 2001, more than 9,500 megawatts of generating capacity have come on-line, most being new, efficient natural gas-fired generators. These additions constitute the largest expansion of the power plant fleet in California history.

Although wholesale prices are substantially lower than at the height of the energy crisis, this came at a cost. To ensure system reliability and control future price volatility, the state negotiated a series of long-term electricity supply contracts. The negotiated prices are much higher than current spot market prices. Furthermore, the contract terms have at times limited the operation of the system, contributing to higher wholesale costs. As a consequence, while the physical infrastructure currently provides reliable electricity, the prices that consumers pay for electricity are higher than in the 1990s and are among the highest in the nation.

Despite recent improvements in the electricity market as a whole, the Energy Commission is concerned about local reliability in San Diego and the San Francisco peninsula. Both areas experienced serious reliability problems during the energy crisis.

¹ California Energy Commission, *Upgrading California's Electric Transmission System: Issue and Actions*, August 2003, Sacramento, CA, P100-03-011 p. 63.

² California Energy Commission, *Public Interest Energy Strategies Report*, California Energy Commission, October 2003, Sacramento, CA, P100-03-012D, p. 43. California Energy Commission, *The Summer 2001 Conservation Report*, California State and Conservation Agency. Sacramento, CA, pp. 12-14.

³ California Energy Commission, *Public Interest Energy Strategies Report*, California Energy Commission, October 2003, Sacramento, CA, P100-03-012D, p. 43, Figure 3-3.

Not surprisingly, both areas have limited local generation and limited transmission capacity to access generation outside of those boundaries. These local reliability challenges warrant priority attention from local and state decision-makers.

Electricity Outlook

Population and economic activity drive electricity consumption growth. Under average weather conditions, the Energy Commission believes that California should have adequate supplies of electricity through 2009. However, since unusually hot weather conditions can significantly drive peak electricity demand, the Energy Commission is concerned about adequate supplies of electricity beginning in 2006. Under adverse weather conditions,⁴ planning reserve margins could fall below seven percent in 2006 and even lower thereafter.

Notwithstanding these concerns, the Energy Commission believes planning reserves can improve through 2010 if price-responsive demand programs, peak reduction program goals, and accelerated RPS goals are met.⁵

Concerns about low reserve margins also are being raised by the California Independent System Operator (CA ISO). The CA ISO believes that reserve shortages could return as early as summer 2004 under certain “adverse” conditions.⁶ These conditions include low levels of hydroelectric power from the Pacific Northwest, higher than anticipated levels of generation outages inside the state, and the forced or “economic” retirement of more than 1,000 megawatts stemming from increasingly restrictive air quality standards. The CA ISO also expects that an additional 3,870 megawatts of generation capacity in California are potentially at risk of retiring during the next several years. Even under average weather conditions, the CA ISO is concerned about resource adequacy and urges the addition of generation and transmission infrastructure.

Dynegy has suggested that more than 10,000 megawatts of merchant generation may be at risk of economic retirement as early as 2005 after their Reliability-Must-Run (RMR) contracts expire next year.⁷ Resource adequacy concerns would be heightened if these plants were retired for economic reasons.

Integrated Resource Planning, Procurement, and Monitoring Process

A reliable electricity system in California will depend on a resource adequacy process that goes beyond simply matching near-term demand with available generation

⁴ Adverse weather conditions refer to a “hot temperature,” 1-in-10 year weather scenario.

⁵ California Energy Commission, *Electricity and Natural Gas Assessment Report*, California Energy Commission, October 2003, Sacramento, CA, P100-03-014, pp. 141-142.

⁶ See California ISO *Five Year Assessment (2004-2008)*, published October 10, 2003 and testimony of CA ISO Representative at Energy Commission IEPR Hearing, October 3, 2003.

⁷ See testimony of Greg Blue (Dynegy) at Energy Commission Integrated Energy Policy Report Hearing, October 2, 2003.

resources. Resource adequacy requirements can best be achieved if forecasting and planning assessments, as well as procurement and monitoring activities, are fully integrated.⁸ Policy and planning efforts must integrate energy efficiency, customer-side generation, and transmission upgrades necessary to bring additional renewable resources into the preferred resource mix. In addition, continuous monitoring efforts must be undertaken to ensure that planned resources are added as expected.

The resource planning process must also reflect the substantial risk and uncertainty in meeting future electricity demand. For example, there is risk in planning for average conditions. As we learned in 2000-2001, unexpectedly low hydroelectric and adverse weather conditions can profoundly influence the reliability and price of electricity. Adequately planning for these contingencies to assure that cost-effective reserve options are available during low hydro and adverse weather conditions will help to prevent supply shortfalls and mitigate price volatility.

Also, economic activity varies cyclically, and these variations in electricity demand are likely to continue to be significant and the mix of resources may not produce as well as we anticipate. Some demand-side options depend on consumer behavior that may fall short of expectations. Similarly, the benefit of accelerating the development of renewable energy is clear, but funding may not be available to bring such benefits to fruition.

To ensure that resource adequacy is maintained, the Energy Commission proposes that an integrated planning, procurement, and monitoring process be established in collaboration with the California Public Utilities Commission (CPUC) and state's utilities and retail electricity suppliers. In the proposed process, the Energy Commission's information and analyses contained in the Energy Report would form the basis for long-term forecasting and supply-demand assessments. This would bring generation, efficiency, and transmission resource alternatives into a more integrated planning process than currently exists.

The CPUC's procurement process would be the means to provide authorization to IOUs to secure long-term generation, renewable resource, and energy efficiency program resource additions. An expanded monitoring process would be created to ensure that a tight feedback loop exists to track progress for the preferred resource additions of energy efficiency, price responsive demand, distributed generation, and renewable resources, and make adjustments needed to assure reliability.

This proposed planning, procurement, and monitoring process should result in improving electricity efficiency, diversifying the electric generation mix with renewables, leveraging opportunities for customer choice, and strengthening the electricity generation and transmission infrastructure, as called for below.

⁸ The Energy Commission also made a similar proposal in the CPUC long run procurement proceeding R.01-10-024.

Recommendation for Resource Planning

- Incorporate the resource plan determined by the Energy Commission and create an explicit resource adequacy requirement for all retail electricity suppliers to guide resource procurement.

Improve Electricity Efficiency

Electricity price stability and reliability depends on harvesting every opportunity to improve end-use and system efficiency. The total amount of electricity consumed directly affects price volatility, the amount of average utility bills, and environmental impacts of the electricity system. Lowering per capita consumption through standards and energy efficiency programs, therefore, will benefit Californians substantially. In 2000, the Rand Corporation found that since 1977 energy efficiency in California has increased economic growth, benefiting the state's economy by \$875 to \$1,300 per capita.⁹ Reducing peak demand for electricity also can mitigate consumer and environmental concerns as well as avoid the need for significant investments in generation equipment that will operate only a few hours a year. While some standards and energy efficiency programs can affect peak demand, a direct and immediate approach can be achieved through dynamic pricing.

Efficiency Standards and Voluntary Conservation

California's building and appliance standards are the most cost-effective means of achieving energy efficiency in the state. Since 1975, the annual peak savings have grown to a total 6,000 megawatts. By 2013, cumulatively building and appliance efficiency standards will have saved Californians \$79 billion on their utility bills.¹⁰

Voluntary energy efficiency programs and individual conservation efforts are the other major sources of energy savings. These programs and efforts are fueled by education, technical assistance, monetary incentives, and tax credits. During the summer of 2001, consumers reduced their electricity consumption dramatically in response to public education campaigns like Flex Your Power. That summer, between 70 to 75 percent of the peak load reductions came from consumer conservation efforts while 25 to 30 percent came from energy efficiency investments.

The Energy Commission and the CPUC are collaborating on a plan to improve the operation of energy efficiency programs, carefully increasing program funding from \$285 million to \$572 million per year by 2008. Over the next two years, the CPUC will oversee the expenditure of \$512 million in public funding. They will re-assess program administration and incorporate efficiency into their procurement process. By spending about \$5 billion over 10 years, the state would save consumers over \$15 billion.

⁹ Mark Bernstein, Robert Lempert, David Lougran and David Ortiz, RAND, *The Public Benefits of California's Investments in Energy Efficiency*, March 2000.

¹⁰ *Public Interest Strategies Report*, pp. 40-41.

Conventional, off-the-shelf technology can produce energy savings in existing buildings. In fact, the bulk of the energy efficiency funds collected under the Public Goods Charge have been spent on existing buildings. The Energy Commission is developing strategies to achieve additional savings in existing buildings. A mix of voluntary and regulatory approaches that supplement current incentive programs may be the most effective plan. The promotion of programs like the Energy Efficient Mortgage can tap into private funds for cost-effective investments in energy efficiency in the residential sector.

Achieving the most economical energy savings requires efficient program design, effective feedback, widespread customer participation, and reliable program funding. California's energy agencies will undertake a rigorous, ongoing monitoring and evaluation program to ensure that the savings and benefits from conservation and efficiency programs are being delivered. Programs not meeting their targets will be modified or eliminated.

The Energy Commission is proposing program goals for energy efficiency savings. These targets would only be converted into firm resource plan additions when they have been funded and an implementation method has been established. They would also be adjusted as monitoring and evaluation results are obtained. Staff analysis suggests that an additional 1,700 MW could be reduced from peak demand statewide by 2013 by doubling current energy efficiency funding levels.¹¹

Dynamic Pricing

In California, the highest peaks in electricity demand are caused almost exclusively by air conditioning during unusually hot weather occurring a few times each summer (50-100 hours per year). These "super-peak" loads have traditionally been met by peaking power plants, either combustion turbines or hydro generators. In emergencies, electric service can be voluntarily interrupted at industrial and commercial businesses, or by turning off residential air conditioners. As a last resort, rotating outages were employed to prevent the entire system from collapsing as it did in the Northeast in August 2003.

Several pricing structures, collectively called dynamic pricing, offer a way to reduce peak demand before the system drops below operating reserve minimums. By sending "real-time" price signals that reflect the actual cost of generating electricity, consumers often are motivated to shift their electricity use from peak times to avoid high electricity rates.

In 2001 and 2002, real-time meters were installed for most large customers. These meters, combined with new communication and control systems, work together to reduce energy use when the price of electricity goes up. Several pilot programs offered customers incentives to use them during periods of peak demand. These customers effectively reduced peak load and increased reliability at times of greatest stress on the system.

¹¹ *Public Interest Strategies Report*, pp. 45-49.

Real-time meters need real-time or other dynamic pricing tariffs and programs to be effective. At present these, rules are only available on a limited basis. In September 2003, the Energy Commission, with input from the CPUC, prepared a report on the feasibility of dynamic pricing, which recommends a process to provide all electricity customers with a choice of flat, inverted tier, time-of-use, or dynamic pricing rates by 2009.¹² While the report found that these tariffs and programs are feasible, the extent to which they can be implemented universally is still unclear. The report recommends continued collaborative assessment with the CPUC to gain a more complete understanding of the extent to which dynamic pricing is appropriate for various types of customers.

The CPUC has adopted an initial set of dynamic pricing tariffs programs for larger customers to use with their real-time meters. The IOUs are now testing a pilot project for residential and small commercial customers. Results of these activities will be available in 2004. The next steps are to determine if the real-time meters will pay for themselves with savings from reducing the state's peak energy use with the correct pricing structures, and to create additional tariffs necessary to achieve the long term goals for price responsive demand adopted by the CPUC.¹³

Recommendations to Improve Electricity Efficiency

The state should:

- Ramp up public funding of energy efficiency activities starting now to harvest statewide electricity savings of at least 1,700 MW more than expected from current programs by 2013.
- Standardize and increase the evaluation and monitoring of energy efficiency programs to ensure that savings and benefits are being delivered.
- Implement appropriate mandates, incentives, and funding to maximize the energy efficiency potential of existing buildings.
- Deploy advanced metering systems and rate structures to help link retail prices with wholesale costs.
- Implement sufficient real-time and dynamic pricing tariffs to satisfy the goal of five percent of system peak load.

¹² The SB 1976 report addressing the feasibility of dynamic pricing was adopted by the Energy Commission on October 22, 2003.

¹³ CPUC Decision, D.03-06-032, San Francisco, CA. April 2003.

Diversify the Electric Generation Mix with Renewables

California's RPS is the centerpiece of the state's strategy to diversify our electricity system. Partly in response to concerns about growing natural gas dependence, the Legislature passed the Senate Bill 1078 (Chapters 516, Statutes of 2002, Sher) establishing the RPS. The RPS requires all retail suppliers of electricity in the state to supply at least 20 percent of their sales from renewable energy resources by 2017. To the extent that electricity generated from renewable resources is sold under long-term contracts, it is immune to fluctuating natural gas prices, and helps to stabilize the market, providing real economic benefit.¹⁴

The state's investor-owned utilities have already made significant strides in meeting RPS targets through interim solicitations conducted under the CPUC's resource procurement proceeding. SCE recently reported that monthly purchases which exceed 20 percent for May and June, 2003; that it expects to achieve "nearly 20 percent" for the full year 2003; and that it expects to exceed 20 percent each year thereafter. SDG&E and PG&E have also reported that they expect to meet their RPS targets well in advance of the 2017 goal. In this context, accelerating the goal of meeting the RPS target by 2010, rather than 2017, should be readily achievable by the investor-owned utilities.

In light of the progress already being achieved under the RPS program, the Energy Commission believes that development of more ambitious longer-term RPS goals for the post-2010 period are warranted. In establishing more ambitious RPS goals, the specific resource mix of each utility, transmission infrastructure, and the availability of cost-effective renewable resources should be taken into account. This may mean that individual utility targets should be developed to replace the more generic statewide RPS goals already established by the Legislature. Development of more ambitious RPS goals will be part of the 2004 *Energy Report* update activities.

Recommendation to Diversify the Electricity System

The state should:

- Enact legislation to require that all load-serving entities meet the RPS goal of 20 percent of retail electricity sales and to accelerate the target date for reaching the RPS goal from 2017 to 2010, with a more ambitious target for 2020.

¹⁴ California Energy Commission, *Draft Final Commission Report Public Interest Energy Strategies Report*, California Energy Commission, October 2003, Sacramento, CA, pp. 101-102. Also, Standard Contract Terms and Conditions for the RPS are discussed in the June 19 CPUC decision 03-06-071, *Order Initiating Implementation of the Senate Bill 1078 Renewables Portfolio Standard Program*, p. 55.

Leverage Opportunities for Customer Choice

Currently, California's electricity customers are limited in their ability to choose their electricity suppliers. This has not always been the case. California's effort to restructure the electricity industry had its roots in the interest of some customers being able to choose their own electricity suppliers. Retail consumer choice provides customers the ability to manage their electricity expenses individually, and determine generation resource preferences. Distributed generation, including cogeneration, an extension of consumer choice, provides benefits to the grid that contribute to reliability and security.

Retail Customer Choice

Beginning in 1998, most Californians were allowed to choose an electricity supplier other than their local utility. At its peak, direct access represented 16 percent of all sales and 25 percent of all large customers' sales. As a result, local utilities found themselves with excess generation when customers left for alternative suppliers.

As electricity prices rose during the energy crisis, many direct access providers could no longer offer savings to customers. As direct access providers dropped out of the market, local utilities suddenly found themselves under-supplied when those same customers unexpectedly returned.

Questions now are being asked whether that ability to choose is still beneficial to large customers and, whether the suspension on direct access should be removed. If the answer to these questions is "yes," the state should examine the natural gas market structure as a possible model for the electricity sector.

However, while direct access was voluntary for electricity customers, the natural gas market is different. Large natural gas customers are assigned to the "noncore" customer group, while smaller customers are designated as "core" customers. Local gas utilities are required to serve core customers, while noncore customers can shop around to purchase the cheapest natural gas supplies.

This model has been successful because it identifies a stable, unchanging group of customers. Since natural gas utilities are protected from customers who might return to their systems without adequate notice, they are able to secure natural gas supplies effectively, plan storage, and adequately cover their costs effectively.

Conceptually, a core/noncore structure in the electricity market, with very explicit contractual conditions for customers to return to their original supplier, could allow utilities to plan with more certainty. At the same time, such a structure may provide merchant generators, who already have permits to build new power plants, with a customer base that is willing to sign long-term contracts. Variations on this core/noncore structure for electricity customers are beginning to be implemented in restructured markets in the East. The existence of such a market may also encourage generators to take merchant risk with less than 100 percent of output under contract.

System reliability is important. Noncore customers and businesses must meet specific reserve requirements, either by self-generating or by buying electricity through another energy provider. All customers would be equally responsible for securing electricity supplies to maintain the system's reliability.

Many critical issues must be resolved, however. The CPUC staff is studying market structure changes and their implications for ratepayers, reliability, the environment, investor confidence, and market volatility, including the core/noncore model. The study is expected to be completed in March 2004.

Distributed Generation

Although different from direct access, consumers do have a range of choices for securing their electricity supplies. Distributed generation, including cogeneration, has tremendous potential to help meet California's growing energy needs as an additional generation source and an essential element of customer choice. Its use offers potential benefits that extend to customers, utilities, and the system as a whole and can be used strategically to meet the policy objectives of the RPS and the reduction of greenhouse gases.

From a customer perspective, distributed generation allows customers to choose between electricity supplied via traditional utility grid service, electricity provided by a non-utility generator located at or near the point of consumption, or by some combination of the two. Benefits include improved reliability and power quality, peak-shaving options, security and efficiency gains through the avoidance of line losses and the use of waste heat for heating and/or air conditioning.

Combined heat and power, or cogeneration, is a major contributor to the state's energy system. Today, cogeneration contributes more than 6,500 megawatts and is a low-cost, low-emission generation option.¹⁵

Distributed generation also offers benefits to the utilities. While the actual benefits of each project will vary based on the location of the generating facility, distributed generation can benefit utilities by deferring transmission and distribution construction, reduce resource acquisition costs, and support the level of ancillary services offered.

To date, California has addressed many technical, institutional, and regulatory barriers inhibiting the effective deployment of distributed generation. During the past three years, the Air Resources Board adopted emissions regulations and guidelines for distributed generation technologies, while the CPUC adopted standardized interconnection rules. In response to industry concerns, the CPUC also exempted 3,000 megawatts of distributed generation over the next 10 years from the Cost Responsibility Surcharge or "exit fee" imposed on customers who leave the grid. The CPUC's decision gives preference to the cleanest technologies. The Energy Commission adopted regulations

¹⁵ See written testimony of Scott Hawley, Watson Cogeneration Company, October 14, 2003

to determine how and which customers qualify for the exemption. Implementation of this process will be completed by February 2004.

A new collaboration between the Energy Commission and CPUC will begin shortly to address outstanding issues establishing an electricity distribution system planning process. Utilities currently do distribution system planning; however, this does not adequately address the benefits and cost of distributed generation. This new rulemaking will be a follow-up to a February 2003 policy decision adopted by the CPUC. The agencies also are committed to working together to target research to identify cumulative system impacts and examine issues associated with new technologies and their use.

Ultimately, the long-term successful deployment of distributed generation will require focused policy direction. Much of the focus should be targeted at increasing consumer awareness about the benefits of using distributed generation, providing financial incentives to offset the cost of installation and funding research to advance technology so that incentives are eventually no longer needed. Consistent with the desire to effectively implement the RPS, statewide incentives should reflect a preference for renewable resources. In making these commitments, policy makers must ensure that the regulatory rules governing the use of distributed generation do not in itself create new barriers to entry.

Recommendations to Leverage Customer Choice

The state should:

- Explore through a collaboration between the CPUC and the Energy Commission how to move to a core/non-core market structure for electricity, with the goal of making recommendations in 2004.
- Create a transparent electricity distribution system planning process that addresses the benefits of distributed generation.
- Explore whether net metering eligibility should extend to all technologies that qualify as Ultra-Clean and Low Emissions, as defined in Section 353.2 of the Public Utilities Code.

Strengthen the Electricity Infrastructure

Despite the significant expected gains in efficiency and reductions in peak demand, at some point the state will need new generating capacity. The type of new plants will depend on the effectiveness of an integrated resource planning, procurement and monitoring process. Additionally, the extent to which the need for and location of new transmission capacity is identified and ultimately permitted will determine whether the state will continue to rely largely on conventional technology or broaden the mix of cleaner renewable resources.

Generation

To achieve the policy goals for electricity outlined in the Energy Report, the CPUC's procurement process must be transparent and incorporate the results of our resource planning, forecasts and assessments. The state's three large investor-owned electric utilities—PG&E, SCE, and SDG&E—who serve over 80 percent of the state's demand, are actively developing both interim and long-term resource procurement plans under the supervision of the CPUC. It appears that the CPUC may authorize some degree of long-term contracting for the three IOUs in its forthcoming procurement decision even if a comprehensive resource adequacy framework is not yet established. However, the Energy Commission believes it is critical that progress be achieved in establishing a resource adequacy framework for the State.¹⁶

California also needs to examine the efficiency of its existing fleet of power plants. There are concerns about the aging fleet of power plants that still operate in the state that are more polluting and less efficient than modern power plants. Many of these older plants are presently needed to maintain local reliability due to their location in the grid. Many have RMR contracts with the CA ISO or long-term contracts with the California Department of Water Resources. Additionally, some of the RMR and Department of Water Resources (DWR) contracts provide that pollution control upgrades can be paid for through contract revenue streams, allowing renovation to meet air district requirements.

Those facilities paid under RMR contracts are unlikely to shut down unless and until their reliability function is provided by a new plant or is no longer needed due to upgrades to the transmission system. However, uncertainty does exist regarding continued future operation of older facilities that either do not have RMR contracts or for which RMR contracts are not renewed. The Energy Commission intends to undertake detailed study of aging power plants and the costs, benefits, and strategies for their replacement as part of the 2004 Energy Report update proceeding.

Transmission Planning

California's transmission system links power generation resources with customer loads in a complex electrical network that must balance supply and demand on a moment-by-moment basis to reliably deliver the lowest cost generation to consumers. The transmission system must be efficient and robust in order to facilitate competitive markets, pool resources for ancillary services, and provide emergency support in the event of unit outages or natural disasters. California's transmission system must deliver these benefits in a manner that maximizes their value while minimizing negative environmental and other impacts as the system is upgraded to respond to changes in

¹⁶ FERC has deferred to the state to develop a resource adequacy requirement as part of the ISO's market redesign. In a recent decision (ER02-1656-015, et.al.) FERC noted the importance of the resource adequacy to signal the need for new infrastructure in the electric power markets and its importance to overall market design and established timelines for when the CA ISO must make a filing on resource adequacy following the CPUC's procurement decision expected in December 2003.

generation and load patterns. This includes the state's commitment to aggressive development of renewable generation through its RPS program.

Under existing generation and load conditions the transmission system regularly experiences congestion on major paths that prevents its optimal economic operation. Also, transmission constraints in major load centers such as San Francisco and San Diego affect both the economic and reliable operation of the system. Transmission upgrades, generation additions and demand-side management actions may provide solutions to these problems. However, the existing transmission planning and permitting processes have not provided effective and timely mechanisms for bringing forward such projects to provide California with a more robust and reliable transmission system.

The state's official role in transmission system planning started with this Energy Report. Transmission planning for about 80 percent of the California grid is the responsibility of the CA ISO. California IOUs must participate in the CA ISO planning process. However, participation by publicly owned utilities and federal agencies is voluntary and, in most cases, they have chosen not to participate. For the most part, publicly owned utilities and federal agencies propose, plan, and build transmission projects to meet their own reliability and economic needs. Merchant transmission line developers may propose economic projects for consideration in the CA ISO process.

As a result of the fragmented approach to transmission planning in the past, no statewide perspective has been brought to the table, regardless of ownership. Consequently, the planning process addressed issues important to the transmission owners and ISO, but may have overlooked issues that are vital to the state's broader interests. Some of these statewide interests include future renewable resource development, right-of-way needs, system reliability, and the efficient use, environmental performance, and economic expansion of the existing system.¹⁷

California must have accurate and comprehensive assessments available to assure the timely planning and ultimate permitting of needed transmission projects. There is a critical need for improvement in the analytical methodologies that are used for evaluating the costs and benefits of transmission projects. Current analytical methodologies used in project planning typically employ short-term analytical horizons, economic valuation methodologies that do not recognize strategic benefits, and cost/benefit evaluations that unduly discount long-term project benefits.¹⁸

Additionally, current analytical approaches typically assume average conditions only and therefore fail to recognize the cost of forecasted low probability, but high impact events, such as droughts, regional blackouts, and temperature extremes. Experience with past transmission investments has shown that while there is tremendous angst in

¹⁷ California Energy Commission, *Upgrading California's Electric Transmission: Issues and Actions*, August 2003, Sacramento, CA, P100-03-011, pp. 61-62. California Energy Commission Consultant Report Prepared by Consortium of Electric Reliability Technology Solutions, *Planning for California's Future Transmission Grid*, P700-03-009, October 2003, p. 15.

¹⁸ *Ibid.*, p.73.

regulatory proceedings over project need, including costs and benefits, transmission lines can pay for themselves in just a few years because of these low probability, but high impact events. Given the longer lead times required for transmission projects and the locational impacts of potential new power plants, modernizing and upgrading the bulk transmission grid should be a centerpiece of the state's electricity planning process.

The Energy Commission recommends that a fully collaborative transmission planning process between the Energy Commission, the CA ISO and the utilities be implemented to address California's critical transmission infrastructure needs. Such a process will be implemented in 2004 to determine the statewide need for bulk transmission projects and to assess and compare the costs, benefits, and alternatives to individual projects. The process, which will build on the ISO's annual transmission plan, will evaluate transmission, generation, and demand-side alternatives to help reinvigorate the state's transmission planning process. The goal of this effort will be to assure that expansion of the grid is made on a timely basis and that statewide objectives are considered in determining transmission investments that best meet the needs of California.

The transmission planning and assessment process will be carried out during the 2004 Energy Report update, will be integrated with other electricity analyses and policy work, and use appropriate assumptions for demand and price forecasting and supply options. The process will evaluate broader strategic benefits than those currently considered. This will include low-frequency, high severity events; strategic values of transmission, such as expanded access to regional markets; enhancement of grid reliability; insurance against major contingencies; and regional alternative economic approaches to evaluation of project costs and benefits, and consider the costs and benefits of generation and DSM as alternatives to transmission.

Transmission Permitting

The permitting of transmission lines in California currently suffers from jurisdictional responsibilities that are fragmented and overlapping, environmental analyses that are inconsistent, and inadequate consideration of regional and statewide benefits. As a result, existing permitting processes create duplication between local, state, and federal agencies, delay in approvals, and denial of needed projects. Because of the existence of several permitting jurisdictions, it may be difficult for a lead agency to conduct an environmental review of the entire project under the California Environmental Quality Act (CEQA).

Merchant transmission projects are subject to review by all local land use agencies whose jurisdictions they cross. However, publicly owned utilities are responsible for performing their own environmental reviews, regardless of the local jurisdictions they cross, potentially calling into question the objectivity and fairness of how transmission projects get reviewed and by whom. Publicly owned utilities determine if proposed projects are needed for reliability and economic purposes based on benefits and costs to their own ratepayers.

Projects proposed by IOUs are subject to CPUC review, whose environmental review process has typically been dependent on external consultants rather than in-house professional staff. This has led to inconsistencies in environmental review and analysis between different transmission line projects and added time and complexity to the review process. In addition, the legalistic nature of the CPUC process has often inhibited effective involvement of the general public.

The CPUC review of the need, under the Certificate of Public Convenience and Necessity (CPCN), for IOU transmission projects has, in many cases, been protracted and subject to multiple delays. As a result, only a very small number of transmission projects that require a CPCN have been constructed by IOUs in recent years.

The CPUC assesses the need for reliability and economic projects proposed by IOUs based on limited cost/benefit analyses that focus primarily on impacts to the sponsoring utility even though the CA ISO charges these costs to all users of its grid. In the CPCN process, the CPUC often re-examines planning issues, refusing to accept determinations made by the CA ISO in the planning process. As a result, projects with regional or statewide benefits that could help the state mitigate market power, stabilize electricity prices and improve the reliability and environmental performance of the electricity system, have been denied permits by the CPUC or suffered long delays in the process due to an inadequate assessment of benefits.

As an example, in the late 1980s, the CPUC denied IOU participation in the California-Oregon Transmission Project. The project was subsequently built by municipal utilities, and now provides critical capacity to their customers for importing low cost electricity from the Pacific Northwest. Current projects that have experienced similar difficulties with the CPUC process include the Path 15 upgrade and the Valley-Rainbow project. Similar problems are likely to plague future projects.¹⁹

Assuring reliable and reasonably priced electricity supplies — increasingly from renewable resources — is dependent on a well-maintained and adequate transmission and distribution system. The state must reinvigorate its planning, permitting, and funding processes to assure that necessary improvements and expansions to the distribution system and the bulk electricity grid are made on a timely basis.

To meet this goal, permitting for new bulk electric transmission lines should be consolidated with, and modeled after, the Energy Commission's current licensing process for generation. This step, as identified in the Energy Commission's collaborative transmission planning process, would include public input and a comprehensive, independent professional staff review in a specific time frame.

This consolidation is consistent with the Little Hoover Commission's 1996 recommendation that generation and transmission permitting be consolidated, and the State Auditor's 2001 recommendation that the Legislature institute a coordinated

¹⁹*Upgrading California's Electric Transmission System: Issue and Actions*, p.63.

electricity transmission siting process similar to the Energy Commission's generation siting process. Given the critical need to upgrade and expand the state's transmission system, the Governor should expedite the consolidation through the exercise of his agency reorganization powers, using the Little Hoover Commission process.

Recommendations to Strengthen the Electricity Infrastructure

The state should:

- Incorporate the resource plan determined by the Energy Commission and create an explicit resource adequacy requirement for all retail electricity suppliers to guide resource procurement.
- Consolidate the permitting process for all new bulk transmission lines within the Energy Commission, using the Energy Commission's power plant siting process as the model.

Section III: Natural Gas

California is the nation's second largest consumer of natural gas. With demand for natural gas increasing to meet the needs of the growing power generation market, increasing price volatility, and California producers able to satisfy only 15 percent of statewide demand, policy makers have questioned California's increasing dependence on natural gas.

In general, the higher overall level of natural gas prices nationwide during the past year calls into question the point of view, developed during the 1980s and 1990s, that natural gas will be plentiful and cheap into the foreseeable future. Our current assessment is that natural gas supplies will continue to be available but at much higher prices than previously anticipated.

Recent Trends in Meeting Natural Gas Demand

In the past three years, California consumers have experienced two significant natural gas price spikes. In the winter of 2000-2001, gas prices were high throughout the country, but much higher in California. Driven by record low hydroelectric availability and underutilized storage, prices regularly exceeded \$8 per million Btu at the California border and peaked at nearly \$60 per million Btu.²⁰ California consumers' natural gas bills increased dramatically relative to consumers in other parts of the nation.

A price spike last winter once again increased natural gas bills to consumers. This time, however, California natural gas users fared well compared to consumers in the rest of the country. National spot prices for natural gas tripled in late February, driven by a prolonged cold snap in the Northeast, concerns about the impacts of war in Iraq, and low nationwide storage levels. Prices in California were also affected, rising above \$9 per million Btu at the height of the price spike. However, California's relatively high storage inventories and unseasonably warm weather allowed prices to return to pre-spike levels relatively quickly and allowed them to stay below national levels.²¹

To focus greater attention on mitigating the potential for future price spikes, the California state agencies involved in natural gas issues formed the Natural Gas Working Group. The group meets regularly to keep the agencies well-informed on key natural gas issues, coordinate development of policies affecting natural gas use, and provide regular reports to the Governor's office on impending issues. The Working Group has allowed the state's activities in natural gas production, purchasing, permitting, regulation, environmental protection, and policy to be relatively well integrated.

²⁰ California Energy Commission, *Natural Gas Market Assessment*, California Energy Commission, August 2003, Sacramento, CA, P100-03-006, p. 27.

²¹ *Natural Gas Market Assessment*, p. 2.

Natural Gas Outlook

Natural gas demand in California is projected to increase due to the growing use of natural gas for electric generation. This trend is even greater in the rest of the western U.S. Natural gas demand for uses other than electric generation is expected to grow at only one-half percent per year in California over the next ten years, compared to a 1.5 percent annual growth rate in natural gas consumption in the electricity generation sector.²²

The Energy Commission forecasts that, under average annual conditions, interstate pipeline capacity is adequate to meet demand through 2013 in Southern California and through 2006 in Northern California. However, meeting peak day demand under extreme weather conditions may require infrastructure investments earlier.²³

Increasing Energy Efficiency in the Natural Gas Marketplace

As stated previously, Californians are energy efficient, aided by the state's stringent building and appliance standards. However, these achievements are simply not enough and much more can be done to save energy.

The integrated nature of the natural gas and electricity markets suggests that programs targeted at cutting both peak and overall electricity use will also have a significant impact on reducing statewide natural gas consumption. Reductions during peak summer hours will have a great impact on ratepayer costs and price volatility, since electricity costs are most affected by underlying gas prices during these periods. The staff analysis suggests that additional funding, targeted specifically at natural gas demand reductions, would yield significant cost-effective reductions.²⁴

Beyond measures that individual consumers and businesses can take to conserve, electricity generators could retire older, less-efficient natural gas-fired power plants and replace or repower them with new, more efficient ones. Unfortunately, many of these older and inefficient plants are presently used to maintain system reliability.

Before California can retire or replace its old, less efficient natural gas-fired power plants, it must examine the contractual arrangements that dictate their use. Many have RMR contracts with the CA ISO or long-term contracts with California's Department of Water Resources. To replace the aging power plants now used for reliability purposes, their cleaner, more efficient upgrades or replacements must recognize their benefits to local reliability and California's overall grid system.

Cogeneration offers yet another option for the effective and efficient use of natural gas. It allows for the more efficient use of natural gas by creating both electric and thermal

²² *Natural Gas Market Assessment*, p. 14.

²³ *Ibid.*, p. 103.

²⁴ *Public Interest Energy Strategies Report*, p. 45

energy. As indicated in written comments, cogeneration plants can achieve heat rates that “match or exceed the heat rates of new gas-fired combined-cycle power plants.” Recognizing the benefits of cogeneration, the Energy Commission is presently conducting research that is expected to further improve the efficiency of cogeneration technologies in the future.²⁵

Recommendation for Natural Gas Efficiency

- Increase funding for natural gas efficiency programs that could achieve an additional 100 million therms of natural gas.

Leveraging Opportunities for Customer Choice

Retail customer choice has been available to California natural gas consumers in many respects since 1988. At that time, driven by the growing movement for a competitive natural gas market and interest in building interstate pipelines inside the state for the first time, the CPUC approved a mechanism whereby customers could procure natural gas from any energy service provider, not just the customers’ local gas utility.

Driven by the success of unbundling the procurement function from other utility services, stakeholders pushed for further unbundling, including storage services and pipeline capacity reservations (both in-state and outside California). Unfortunately, the latter efforts have proceeded with mixed results.

Since the adoption of the PG&E Gas Accord Settlement, customers in Northern California have had the ability to reserve long-distance pipeline transmission capacity specific to a particular location. SoCalGas, on the other hand, has not offered such specificity, only allowing customers to reserve capacity in its system. In that case, any oversubscription of capacity at a particular location may result in a pro rata reduction in capacity reserved for particular customers. Hence, SoCalGas cannot offer firm trading rights to its customers, reducing the value the “unbundled” capacity rights might otherwise offer.

Ultimately, effective utilization of the natural gas system from a customer and utility perspective depends on the consistent application of rules and regulations statewide. California currently lacks this consistency and it is important that this inconsistency be resolved.

Reducing Natural Gas Dependence

With demand for natural gas increasing to meet the needs of a growing electricity generation market, concerns have emerged among state policy makers about California’s increasing dependence on natural gas. These concerns have become even more pronounced with increased price volatility. The risks associated with long-run

²⁵ *Public Interest Energy Strategies Report*, Chapter 6.

increases in the price of natural gas and supply shortfalls can be mitigated by reducing demand for natural gas for power generation. Effective implementation of the RPS, as described earlier in this report, is the critical element of reducing the state's dependence on natural gas.

Despite its support of renewable energy, California is increasingly dependent on natural gas generation. Natural gas-fired generation in California is expected to increase from 36 percent in 2004 to 43 percent in 2013.²⁶ In low water years, reductions in available hydroelectricity will push this percentage even higher. If California accelerates its use of renewable generation and meets the RPS goal of 20 percent by the year 2010 instead of 2017, and continues funding energy efficiency and DSM at present levels, we can double the natural gas savings that come from displacing natural gas-fired generation by 2013.

Using other fuels can also reduce the demand for natural gas facilities. For a host of legal, environmental, and cost reasons, nuclear, large hydroelectric, residual fuel oil, and coal facilities are unlikely candidates for offsetting natural gas-fired generation for California. On the other hand, the development of cost-effective renewable resources (wind, geothermal, biomass, and solar) have tremendous potential in California to meet part of our future demand.

Natural Gas Infrastructure

California is located at the western end of a complex network of pipelines that spans the United States and Canada. While California has managed its own natural gas demand growth, supply sources, and infrastructure reasonably well, it is nonetheless greatly affected by supply/demand imbalances that occur in other regions, particularly with respect to infrastructure constraints that impede supply deliverability. Given the strong growth in natural gas demand in Nevada, Arizona, and the Pacific Northwest, it is paramount that California continues to promote: 1) development of additional interstate pipeline capacity from Canada, the Southwest, and the Rocky Mountains, 2) operational flexibility to utilize its in-state storage, 3) development of in-state productive capacity, and 4) development of non-traditional supply sources such as LNG.

Since the energy crisis, the state has increased access to out-of-state production through expansions of key interstate pipelines delivering gas from the Southwest, Canada, and the Rocky Mountains. The FERC has approved, on an expedited basis, additional interstate pipelines that now bring additional supplies to California. Under the watchful eye of the Natural Gas Working Group and CPUC oversight, SoCalGas, and PG&E have expanded their pipeline capacities to receive more out-of-state supplies and have enhanced the operational flexibility of their pipeline systems.

²⁶ California Energy Commission, *Electricity Infrastructure Assessment*, California Energy Commission, May 2003, Sacramento, CA, P100-03-007F.

Need for Effective Storage

Effective utilization of storage is critical to maximizing the operational flexibility of the natural gas system in California and reducing the need to add infrastructure. California presently has more than 240 billion cubic feet (Bcf) of storage capacity available with the ability to remove more than 5 Bcf per day on a peak winter day.²⁷

Increases in storage capacity and withdrawal capability in both northern and southern California are important to meeting the growing energy needs of California gas customers. Equally important is the need to create a regulatory framework that encourages the effective use of storage throughout the state. Unfortunately, the existing tariff structure allows customers to reserve storage capacity but not necessarily fill it. This raises the likelihood that storage capacity will not be fully utilized, resulting in not enough gas being injected into storage during the storage injection season. Suboptimal use of storage leads to higher gas prices.

A result of the energy crisis, the CPUC authorized the utilities to increase natural gas storage capacity, including increased withdrawal and injection capabilities for existing utility storage and the addition of new non-utility storage facilities. As important as these improvements are to enhance capability of the state's natural gas system, further improvements will be necessary during the next decade.

Recognizing the Role of California Natural Gas Production

California gas producers play an important role in meeting the needs of natural gas consumers. As mentioned earlier, these producers satisfy approximately 15 percent of statewide natural gas demand. Stakeholders representing a number of producers suggested that this share could easily be maintained or even grow further if some of the various economic and regulatory disincentives are removed. Some of these disincentives include but are not limited to the following:

- Restricted access to utility gas gathering systems
- Lack of a streamlined permitting process for wellhead and production facilities
- Strict utility enforcement of gas quality specifications, with little opportunity to blend low Btu-quality gas with higher Btu-quality gas
- Limited access to land where natural gas deposits exist
- Absence of any rules enabling the effective testing of a new gas discovery²⁸

Some parties have suggested that regulatory and tax incentives should be provided by the state to expedite drilling and exploration. Others have argued that California producers have better access to California natural gas markets.²⁹

²⁷ California Energy Commission, *Electricity and Natural Gas Assessment Report*, California Energy Commission, October 2003, Sacramento, CA, P100-03-006D, p. 94.

²⁸ See written testimony of Joe Sparano (Western States Petroleum Association), dated August 29, 2003.

²⁹ See testimony of John Allen (Occidental Petroleum – Elk Hills) at Energy Commission Integrated Energy Policy Report Hearing, October 10, 2003.

As a starting point toward removing these barriers, the Energy Commission, in collaboration with the Department of Conservation's Division of Oil, Gas, and Geothermal Resources, is beginning to explore these issues through the formation of a regulatory working group to promote cooperation between state and federal regulatory agencies, gas producers, and other interested parties to help improve the permitting process for drilling natural gas wells.

Liquefied Natural Gas (LNG) Development

There are growing concerns that natural gas production from existing basins are in decline and unable to keep pace with growing demand for natural gas in North America. Many public and private natural gas analysts now predict that North American gas production will decline in future years. It is also unclear whether the industry can provide enough infrastructure to find and extract new sources of supply as well as add enough pipeline capacity to match current and future natural gas demand. Therefore, there is considerable interest in further developing infrastructure for LNG in North America to supplement our current supply of natural gas.

The completion of one or more of the currently proposed LNG facilities on the West Coast could add in excess of 1 Bcf per day of additional supplies. More importantly, LNG provides an opportunity for California to access supply from other countries and continents that may help bring downward pressure on Canadian and U.S. gas prices. However, overdependence on a foreign supply source has to be an additional concern.

In the past two years, a number of developers have shown interest in building LNG facilities on the West Coast, along the coast of both Mexico and California. There have been at least 10 projects proposed on- and off-shore along the West Coast during the past year.³⁰ However, financial backing is probably available to support construction of one or two projects. Given recent regulatory activity in Mexico, which includes approval of all necessary permits for one proposal, it appears likely that at least one project will be built along the Baja California coast. California could benefit economically from LNG infrastructure being provided in the state.³¹

LNG does not come without issues that will need resolution before it enters any pipeline system on the West Coast. Some are concerned about the relative safety of LNG. Others are concerned that the relative heat content of delivered LNG, which far surpasses what is considered to be appropriate for the utility systems in California, makes it difficult to move the gas into California without significant treatment or blending. Others are concerned about the type of natural gas sales contracts that are needed to support these large investments.

³⁰ California Energy Commission, Pending Natural Gas Infrastructure Projects, [http://www.energy.ca.gov/naturalgas/documents/PENDING_PROJECTS.PDF].

³¹ See testimony of Gene Voiland (AERA Energy) at Energy Commission Hearing, October 10, 2003.

To more effectively address LNG issues at the state government level, the Energy Commission recently sponsored the formation of the LNG Interagency Permitting Working Group. The group meets on a regular basis and includes 13 public agencies potentially involved with permitting any potential LNG facility in California. The goal of the group is to ensure that any LNG development is consistent with state energy policy that balances environmental protection, public safety, and local community concerns.

Recommendations for Improving Natural Gas Infrastructure

The state should:

- Ensure that existing natural gas storage capacity is appropriately used to provide adequate supplies and to protect prices.
- Encourage the construction of and coordinate permit reviews with all entities to facilitate development of LNG infrastructure on the West Coast.
- Remove barriers to the use of natural gas produced in California to ensure that California production can be delivered to consumers.

Section IV: Transportation Energy

The demand for transportation fuels in California is increasing at an alarming rate, surpassing in-state refining capacity. California's refiners rely increasingly on imported petroleum products to meet demand. Imports enter through ocean port facilities that are reaching maximum capacity. The industry must expand its import and storage facilities, otherwise supply constraints and price volatility will continue.

The inability of the petroleum industry to fully meet today's needs causes concern about its ability to meet the growing demand for gasoline and diesel in the future. Without assurances from the industry how they will meet growing demand, the state must take aggressive steps to safeguard consumers and the California economy against more severe supply disruptions and price volatility.

The Energy Commission and California Air Resources Board have developed a strategy to reduce California's singular dependence on petroleum that depends primarily on raising new vehicle fuel economy standards and, to a lesser extent, increasing the use of alternative fuels, and introducing advanced vehicle technology such as hybrid-electric and hydrogen fuel cell vehicles.³² The Energy Commission is beginning to work with stakeholder groups to identify avenues to effectively implement the strategy.

The petroleum industry supports cost-effective vehicle efficiency improvements and alternative fuels development. It cautions, however, that a goal to significantly reduce long-term demand for petroleum may create disincentives to infrastructure investments, such as import and storage facilities, that must be made now. The state must balance supply and price consequences of infrastructure constraints with the potential benefits of moderating our dependence on petroleum.

Recent Trends in Meeting California's Transportation Energy Needs

In just the past 20 years, the demand for gasoline and diesel has jumped 53 percent.³³ Californians consume nearly 48 million gallons of petroleum fuels each day, accounting for almost half of all the energy consumed in the state each year.³⁴ Several factors explain the increase, including:

- Population growth and an increase in the number of on-road vehicles
- Declining per-mile cost of gasoline
- Land-use patterns that place jobs and housing increasingly farther apart

³² Joint Agency Report, California Energy Commission and California Air Resources Board, *Reducing California's Petroleum Dependence*, California Energy Commission, August 2003, Sacramento, CA, P600-03-005F.

³³ California Energy Commission, *Transportation Fuels, Technologies, and Infrastructure Assessment*, California Energy Commission, October 2003, Sacramento, CA, P100-03-013D, pg 7.

³⁴ California Energy Commission, *Forecasts of California Transportation Energy Demand, 2003-2023*, Staff Report, California Energy Commission, 2003, Sacramento, CA, P100-03-016.

- The shift in consumer preference to larger, less fuel efficient motor vehicles
- A lack of viable and cost-effective alternatives to petroleum fuels

Until recently, California refiners produced enough transportation fuels to meet in-state needs and to export to neighboring states. However, while demand has grown considerably, refining capacity has not. The last refinery built in California was in 1969. Since then, several refineries have shut down, reducing statewide refining capacity by nearly 20 percent.³⁵

In spite of their age, the industry has upgraded and modernized its refineries over the years in response to meet the state's very tough fuel specifications. They now are some of the most advanced and produce the cleanest-burning fuels in the world. Most recently, the industry is making significant modifications to its terminal facilities in response to the Governor's ban on MTBE. The \$800 million in modifications have proceeded without disrupting fuel supplies.

Since the mid-1990s, refiners have been able to increase production of gasoline and diesel at existing facilities through process improvements, but not enough to keep pace with the steadily growing demand. As a consequence, California increasingly relies on imports of blending components and finished products from other states and countries to meet demand. Today, refiners import about 4 million gallons of product each day, a tenuous situation given the limited number of out-of-state refineries currently producing California gasoline.³⁶

California is not connected by pipeline to refining centers in other states, therefore, gasoline, diesel, and blending components must be imported by marine tanker. The state's marine facilities—where imports are off-loaded, stored and distributed—operate at or near capacity. Likewise, refineries in California operate near maximum capacity for much of the year. Since inventories represent only 18 days of supply on average³⁷ and replacement supplies can take up to eight weeks to reach marine terminals, any upset in the petroleum system immediately translates into tight supplies and higher prices at the pump.

Furthermore, gasoline and diesel demand does not drop when prices spike, so even small shortfalls in supply can cause very significant price swings. Spurred by record prices for crude oil and refinery problems in California, the average price for gasoline spiked to a record level of \$2.15 a gallon in March 2003.³⁸

As California learned in August 2003, infrastructure problems in other states can

³⁵ California Energy Commission, 1981- 2003, PIIRA Reports, Operable capacity of nine reports.

³⁶ Ibid., pg 26.

³⁷ California Energy Commission, *California Strategic Fuels Reserve*, Revised Contract Report, California Energy Commission, July 2002, Sacramento, CA, P600-02-017D, pg 54.

³⁸ California Energy Commission, *Transportation Fuels, Technologies, and Infrastructure Assessment*, California Energy Commission, October 2003, Sacramento, CA, P100-03-013D, pg 36.

seriously affect California. When an Arizona pipeline bringing gasoline supply from Texas recently ruptured, California refiners diverted supply to Arizona because California was the only nearby source of gasoline. When combined with several refinery outages on the West Coast, the events caused the average price of gasoline in California to reach \$2.10 a gallon.³⁹

Transportation Energy Outlook

Petroleum will be the primary source of California's transportation fuels for the foreseeable future. Over the next 20 years, the Energy Commission projects that gasoline and diesel demand for on-road vehicles will increase 36 percent and the demand for jet fuel will more than double.⁴⁰

As demand continues to rise, imports of foreign crude oil will increase as in-state and Alaskan supplies diminish. Additionally, the transition to ethanol as the only oxygenate for California gasoline will reduce refinery production by as much as 5 percent.⁴¹ Low-sulfur fuel regulations scheduled to take effect in 2006 also may further limit refining production. With refineries operating close to full capacity, daily imports of gasoline and diesel will more than double to 10.1 million gallons by 2010.⁴² Unless import facilities expand, gasoline and diesel markets will become increasingly volatile, with the likelihood of supply shortages and more prolonged periods of high prices.

Improve Vehicle Efficiency

In almost every area of energy consumption, Californians have put efficiency first. The state's standards continually set new benchmarks for electricity and natural gas efficiency—but, not transportation. California does not have similar authority for transportation and neglect at the federal level has allowed new vehicle efficiency to decline in recent years. This is a cause of the significant increase in gasoline consumption.

In 1975, Congress established corporate average fuel economy (CAFE) standards for new passenger cars and light trucks. Since current CAFE standards, 27.5 miles per gallon for cars and 20.7 miles per gallon for light-trucks, including SUVs and minivans, have not changed since 1985, automobile manufacturers have not had the incentive to improve new vehicle fuel economy. Further, sales for light trucks have increased to nearly 50 percent of all new vehicles sold in California. These factors combined have contributed to the dramatic rise in gasoline demand.

³⁹ California Energy Commission, *Causes for Gasoline and Diesel Price Increases in California*, California Energy Commission, September Monthly Update, September 2003, Sacramento, CA, pg 4.

⁴⁰ California Energy Commission, *Forecasts of California Transportation Energy Demand, 2003-2023*, Staff Report, California Energy Commission, 2003, Sacramento, CA, P100-03-016.

⁴¹ California Energy Commission, *Transportation Fuels, Technologies, and Infrastructure Assessment*, California Energy Commission, October 2003, Sacramento, CA, P100-03-013D, pg 28.

⁴² Ibid., pg 26.

In its recent joint report, *Reducing California's Petroleum Dependence*, the Energy Commission and California Air Resources Board examined a range of options to reduce petroleum consumption in California. In the near term, the state can quickly realize significant savings by establishing a tire efficiency program, requiring government fleets to use the most efficient vehicles in a given class, and educating consumers about proper vehicle maintenance. Together, these actions can reduce fuel demand by three to five percent, or about one-half billion gallons each year.⁴³

The state has taken action on two of these measures. SB 844 (Chapter 645, Statutes of 2003, Nation) requires the Energy Commission to establish a tire testing procedure, a tire efficiency rating system, and replacement tire efficiency standards. The Department of General Services also is revising its vehicle procurement requirements to include efficiency as a primary criterion.

More importantly, the report shows that improving the fuel efficiency of new vehicles would dramatically reduce petroleum demand and that the efficiency of new cars and light trucks can be improved significantly with existing and emerging automotive technologies. If the combined fuel economy of new cars and light trucks were improved to 40 miles per gallon (mpg) beginning in the 2008 model year, growth in demand for on-road transportation fuels would begin to decline by the year 2010 and continue to decline to current levels by 2020. This could save over 6 billion gallons per year.⁴⁴ For most of the efficiency options evaluated, fuel savings for consumers exceed the increased cost of a more fuel-efficient vehicle.

The federal government, through CAFE standards, has sole authority to require improvements in vehicle efficiency. California can only act in concert with other states and stakeholders to influence needed changes at the federal level. In the event the federal government fails to increase efficiency standards, the Energy Commission recommends that the state carefully reassess its strategy rather than immediately implement pricing measures or other fuel taxes and fees to lower demand.

Recommendations to Improve Vehicle Efficiency

The state should:

- Adopt a goal of reducing demand for on-road gasoline and diesel to 15 percent below 2003 levels by 2020.
- Build a coalition with other states and stakeholders to influence Congress and the Department of Transportation to double the combined fuel economy of new passenger cars and light trucks by 2020. If the federal government fails to revise

⁴³ Ibid, pg 13.

⁴⁴ California Energy Commission staff work, staff used the Futures Model to provide input to the Joint Agency Report, California Energy Commission and California Air Resources Board, *Reducing California's Petroleum Dependence*, California Energy Commission, August 2003, Sacramento, CA, P900-03-005

CAFE standards, California must reassess its petroleum reduction strategy.

- Develop a public information program to inform consumers of the fuel savings benefits of efficient tires, proper tire inflation, and vehicle maintenance.

Diversify Transportation Fuels

California's demand for gasoline and diesel fuel is projected to increase by almost 35 percent over the next 20 years. Improving vehicle efficiency is the single most effective means to reduce petroleum dependence. However, the Energy Commission and the Air Resources Board conclude that improving vehicle fuel economy alone will not be enough to maintain petroleum reduction goals over the long-term. By 2020, the demand for gasoline and diesel will begin to increase once more as the number of vehicle miles traveled overwhelms efficiency benefits. For that reason, we must also increase our use of alternative fuels, including:

- Natural gas
- Ethanol
- Liquefied petroleum gas (LPG)
- Non-petroleum-derived diesel fuel such as Fischer-Tropsch and biodiesel
- Electricity
- Hydrogen

Through the efforts of the Energy Commission, Air Resources Board, local air districts, federal government, transit agencies, utilities, and other public and private entities, California is home to a growing number of alternative-fuel vehicles. More than 20,000 cars, transit buses and trucks currently operate on natural gas and LPG, along with the nearly 13,000 electric vehicles. California also has over 40 natural gas and LPG fueling stations and is host to the California Fuel Cell Partnership.⁴⁵

However, increasing the use of these fuels face significant uncertainties. These include the availability of new vehicle technologies, the cost and availability of new fueling infrastructures, and acceptance of these fuels by consumers. Given the recent supply and price volatility experienced in the natural gas market, California should proceed cautiously in creating a large natural gas demand for transportation.

Providing ethanol fuel for the existing fleet of flexible fuel vehicles currently on the road in California will help to diversify the state's market for transportation fuels. All U.S. automobile manufacturers currently build flexible fuel vehicles. California's fleet now includes an estimated 200,000 vehicles, yet because no fueling infrastructure exists to supply ethanol, these vehicles use gasoline. This fleet could grow to as many as

⁴⁵ California Energy Commission, *Transportation Fuels, Technologies, and Infrastructure Assessment*, California Energy Commission, October 2003, Sacramento, CA, P100-03-013D, p. 10, 63.

400,000 vehicles by 2010.⁴⁶

Recommendation to Diversify Fuels

The state should:

- Increase the use of non-petroleum fuels to 20 percent of on-road fuel consumption by 2020 and 30 percent by 2030.

Strengthen the Transportation Energy Infrastructure

California is importing increasing amounts of crude oil, blending components and finished gasoline and diesel fuels to meet the state's growing demand. Yet, the state's import facilities do not have the capacity to effectively handle the increase flow of product. The Energy Commission has conducted a preliminary study of the state's ability to import petroleum products and concluded that the infrastructure is at, or near, capacity.⁴⁷ The problems are most serious in Southern California, where the bulk of increased quantities of imported crude oil and finished petroleum products will be received.

Unless this infrastructure is expanded, refiners will not be able to meet demand with additional imports, which may increase price volatility. It is essential that additional marine and storage facilities are constructed and operating as the demand for transportation fuel increases.

The Energy Commission is planning a more comprehensive evaluation of the state's petroleum infrastructure including refineries, pipelines, ports, and storage facilities to identify product flows, pricing, and bottlenecks in the system and recommend solutions. An important component of this effort is the rulemaking already underway to expand and improve the process by which the industry must report to the Energy Commission information regarding petroleum product volumes and pricing. We expect this proceeding to be completed in early 2004.

A major barrier to expanding petroleum infrastructure is the difficulty in acquiring construction permits from multiple local, state, and federal authorities. These existing layers of permitting are inefficient and overlapping and contributes to the continuing shortage of storage capacity. This shortage leads to higher lease and rental rates for storage tanks. As a result, suppliers minimize their inventories, making for tighter markets and higher prices.

⁴⁶ California Energy Commission staff, Presentation: *California's Transition from MTBE to Ethanol and Beyond* at the U.S. Department of Energy and California Energy Commission sponsored "California Ethanol Workshop", April 14-15, 2003, Sacramento, CA.

⁴⁷ California Energy Commission, *California Marine Petroleum Infrastructure*, Consultant Report, California Energy Commission, Sacramento, CA, P600-03-008.

The state has successfully dealt with similar permitting problems. In 1974, to help license power plants, the Warren-Alquist Act, established the Energy Commission as a one-stop permitting agency. The Energy Commission's 12-month public process consolidates all state and local agencies into a single permitting process that meets the requirements of the California Environmental Quality Act and ensures that local concerns are balanced against statewide needs.

Recommendation for Transportation Energy Infrastructure

The state should:

- Establish a one-stop licensing process for petroleum infrastructure—including refineries, import and storage facilities, and pipelines—that would expedite permits to increase supplies of transportation energy products available to California while maintaining environmental quality.

Section V: Stewardship of California's Environment

California's increasing need for energy places added pressure in the state's electricity, natural gas, and transportation fuel infrastructures as well as the state's environment. California must strike a balance between delivering increasing levels of energy and its commitment to environmental quality. The challenge to policy makers will be, not just to sustain the current status of the environment, but to improve environmental quality while meeting the wide-ranging demand for energy. This section addresses several topics where energy and the environment are inextricably linked and where clear policy direction is warranted.

Power Plant Water Use and Waste Water Discharge

Clean fresh water is an increasingly critical resource in California. California's burgeoning population, expected to grow from 35.5 million in 2003 to 47.5 million in 2020, combined with businesses and industry, will continue to use increasing quantities of fresh water at rates that cannot be sustained. Imbalances in available fresh water supply results in "average year" shortages projected in every region except parts of the San Francisco Bay area and the North Coast.⁴⁸ Energy facilities are among the state's many water users and have the potential to affect fresh water supply and water quality.

Since 1996, an increasing number of new power plants have been sited in areas with limited fresh water supplies. As a result, use of fresh water for power plant cooling is increasing. Although water use for power plant cooling is relatively small on a statewide basis, it can cause significant impacts to local water supplies.

Degraded surface and groundwater can be reused for power plant cooling. When sufficient quantities are available, reclaimed water is a commercially viable cooling medium. Of the 8,409 MW of new cogeneration or combined cycle generated capacity permitted by the Energy Commission and brought on line in California between 1996 and September 2002, more than 1,580 MW or 19 percent is cooled using recycled water. Alternative cooling options, such as dry cooling, are also available and commercially viable, and can reduce or eliminate the need for fresh water. Two projects using dry or air cooling became operational in 1996 and 2001. A third project using dry cooling in San Diego County has been permitted by the Energy Commission.

Water quality impacts to surface water bodies, groundwater and land from waste water discharges are being increasingly controlled through use of technologies such as zero liquid discharge systems in order to meet the state's water quality standards. Of the 8,409 MW of new cogeneration or combined-cycle generating capacity permitted by the

⁴⁸ DWR (Department of Water Resources), *The California Water Plan Update*, 1998, Bulletin 160-98, Volumes I and II.

Energy Commission and brought on line in California between 1996 and September 2002; 16 percent used zero liquid discharge. More than 35 percent of the projects now under licensing review or under construction will use this technology.

Continued use of once-through cooling at existing power plants may impact aquatic resources in the coastal zone, bays, and estuaries. While no power plants using once-through cooling have been proposed for new California coastal sites in the last two decades, proposals to repower existing generation units at these sites have not switched to dry cooling or use of recycled water.

Water conservation is of paramount importance to the state. Indeed, conserving fresh water and avoiding its wasteful use have long been part of the state's water policy, as reflected in the State Constitution, Article X, Section 2. Because power plants have the potential to use substantial amounts of water for evaporative cooling, the Energy Commission has the responsibility to apply state water policy to minimize the use of fresh water, promote alternative cooling technologies and minimize or avoid degradation of the quality of the state's water resources.

State water policy regarding power plants is specified in Resolution 75-58 adopted by the State Water Resources Control Board (the Board).⁴⁹ With respect to using fresh water, the Resolution articulates an underlying policy "to protect beneficial uses of the state's water resources and to keep the consumptive use of freshwater for power plant cooling to that minimally essential for the welfare of the citizens of the state."⁵⁰ The policy reflects the state's concerns over discharges from power plant cooling, as well as the conservation of fresh water for cooling purposes.

Specifically, the Board states that it "encourages ... power generating utilities and agencies to study the feasibility of using wastewater for power plant cooling" and "encourages the use of wastewater for power plant cooling where it is appropriate."⁵¹ The Board also lists specific "discharge prohibitions" to limit the discharge of blowdown and waste waters from cooling facilities so as to "maintain existing water quality and aquatic environment of the state's water resources."

The Board further states as a matter of principle, "Where the Board has jurisdiction, use of fresh inland waters for power plant cooling will be approved by the Board only when it is demonstrated that the use of other water supply sources or other methods of cooling would be environmentally undesirable or economically unsound."⁵²

⁴⁹ Adopted in 1975, the Resolution is outdated in part in that it promotes once-through cooling with ocean water without regard to impacts to aquatic resources. Aquatic biological data collected in the last 28 years show that the biological harm caused by using ocean water for once-through cooling could be substantial. The adoption of 75-58 should be used to inform the Board in any decision on updating the Resolution.

⁵⁰ Department of Water Resources, *Water Quality Control Policy on the Use and Disposal of Inland Waters Used for Power Plant Cooling*, June 19, 1975, mimeo, p. 1.

⁵¹ *Ibid.*, p. 5.

⁵² *Ibid.*, p. 4.

The Warren-Alquist Act reiterates state water policy in terms of conserving water and using alternative sources of water supply: “It is further the policy of the state and the intent of the Legislature to promote all feasible means of energy and water conservation and all feasible uses of alternative energy and water supply sources” (emphasis added).⁵³

Consistent with the Board policy and the Warren-Alquist Act, the Energy Commission will approve the use of fresh water for cooling purposes by power plants which it licenses only where alternative water supply sources and alternative cooling technologies are shown to be “environmentally undesirable” or “economically unsound.” Additionally, as a way to reduce the use of fresh water and to avoid discharges in keeping with the Board’s policy, the Energy Commission will require zero-liquid discharge technologies unless such technologies are shown to be “environmentally undesirable” or “economically unsound.” The Commission interprets “environmentally undesirable” to mean the same as having a “significant adverse environmental impact” and “economically unsound” to mean the same as “economically or otherwise infeasible.”⁵⁴

Global Climate Change

Climate change represents a significant risk to California. The signs of a global warming trend are becoming more evident and much of the scientific debate is now focused on expected rates of future changes. Rising temperatures and sea levels, along with changes in hydrological systems, are threats to California’s economy, public health, and environment. Although these changes are not entirely predictable, climate change could lead to flooding of coastal communities, drought on our farmlands, disease and fires in our forests, decline of fish populations, reduced capacity to generate hydropower, and loss of habitat. Preliminary research suggests that energy expenditures in California alone could increase by as much as \$2 billion by 2020 as a result of warmer climatic conditions.

While California has been a leader in climate change through its inventory activities and the establishment of the Global Climate Change Registry, more can be done to prepare for an uncertain climate future and to improve the resiliency of the state’s economy. Taking appropriate steps to address risks posed by climate change can help insure a more sustainable future and benefit the state’s citizenry and natural and economic resources.

⁵³ Public Resources Code section 25008.

⁵⁴ “Feasible” is defined under the California Environmental Quality Act as meaning “capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social and technological factors.” (Cal. Code Regs., tit. 14, § 15365.) The same definition exists in the Energy Commission’s siting regulations. (See, Cal. Code Regs., tit. 20, § 1702(e).)

Recommendations for Global Climate Change

The state should partner with its neighbors to take leadership positions to address global warming by undertaking actions including, but not limited to, the following:

- Require reporting of greenhouse gas emissions as a condition of state licensing of new electric generating facilities
- Support the goals to reduce current petroleum consumption by motor vehicles by 15 percent by 2020
- Use sustainable energy and environmental designs in all state buildings
- Require all state agencies to incorporate climate change mitigation and adaptation strategies in planning and policy documents
- Account for the costs of greenhouse gas emission reductions in utility resource procurement decisions

Cross-Border Issues

California's environment along its border with Mexico is affected by energy consumption across the border as well as by energy consumption in California. Mexico has experienced strong industrial growth in its border area, resulting in increasing air pollution. States along the United States/Mexico border are affected by the increased emissions from inefficient power plants and boilers, fueling facilities, highly polluting industrial facilities, and traffic congestion. Baja California presents both compelling energy challenges and business opportunities for California.

Recommendation for Cross-Border Issues

The state should:

- Conduct a Mexico Energy Program to fulfill joint declarations developed by the Border Governors' Commission Energy Worktable. The program should address energy and air quality issues on the California-Mexico border and stimulate energy technology exports for California energy companies.

Hydroelectricity Facility Relicensing

Hydroelectricity has historically played an important role in meeting California's electricity needs. Its low production costs and unique ability to meet critical peak demand have long benefited the state's ratepayers. Some hydroelectric projects unfortunately have serious environmental consequences such as significant, ongoing

impacts to many California rivers and streams, native salmon and trout populations, and the water quality needed to support sustainable riverine ecosystems.

Restoration of imperiled salmon and trout fisheries is one of California's environmental policy objectives. Since most of the state's hydroelectric facilities were licensed by FERC more than 30 years ago, they were not subject to current environmental standards. By 2015, 44 FERC-licensed projects in California will seek renewals, affording the state the rare opportunity to address problems with existing fisheries and aquatic resources. In addition, decommissioning of high environmental impact hydroelectric facilities that supply little power is a possible method of restoring important aquatic habitat.

California's Department of Fish and Game and the State Water Resources Control Board both have principal roles as the state's representatives in FERC's re-licensing of hydroelectric facilities. The Energy Commission is helping these agencies and FERC understand the effects that operational and structural changes to these facilities will have on regional and statewide electricity supply.

Section VI: Conclusion

In three short years, California has weathered an electricity crisis, unparalleled natural gas price spikes, and the highest gasoline prices in the nation.

As the fifth largest economy in the world, energy is a vital concern to California. Through crises, error, and innovation, California remains a world leader in energy policy and technology. What begins in California eventually moves throughout the world.

Since the 1970s, California has responded to each energy challenge by developing efficiency programs, promoting new forms of renewable energy, and fostering research and development. These efforts pushed the boundaries of regulation and private investment.

California's growing population demands reliable and reasonably priced energy. Yet today, California finds itself facing an aging energy infrastructure and ever-growing demand.

The state rightfully feels a sense of urgency. Finding the most cost-effective, reliable, efficient resources, while protecting our environment, calls for more than a "business-as-usual" approach. If California's energy future is to remain economically workable and environmentally sound, progressive energy policy must remain high on the state's agenda.

The recommendations described in this report represent an aggressive, wide ranging agenda for decision makers, businesses, and individuals. The Energy Commission believes that this report, along with its subsidiary reports, lays the proper foundation for future action.